

PERFORMANCE REPORT

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FEDERAL AID PROJECT F-221-M-3

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2012 Fisheries Management Survey Report

**Sam Rayburn Reservoir**

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## SURVEY AND MANAGEMENT SUMMARY

Fish populations in Sam Rayburn Reservoir were surveyed in 2012 using electrofishing and in 2013 using gill netting. Anglers were surveyed from June 2012 through February 2013 with a creel survey. Historical data are presented with the 2012-2013 data for comparison. This report summarizes the results of the surveys and contains a management plan for the reservoir.

- **Reservoir Description:** Sam Rayburn Reservoir is an 111,422-acre impoundment of the Angelina River in Angelina, Jasper, Nacogdoches, Sabine, San Augustine, and Tyler counties in southeast Texas. Water level fluctuations average 6 to 7 feet annually. Aquatic habitat consists of aquatic vegetation (primarily hydrilla and American lotus) and standing timber.
- **Management History:** The black bass fishery is the most popular at Sam Rayburn Reservoir (69 - 80% of annual angling effort, which includes over 400 bass tournaments per year). Approximately 10 - 15% of anglers target crappie and 5 - 10% target catfish. Angler interest in more restrictive length limits for Largemouth Bass and potential biological and economic impacts of bass tournaments prompted research from 2004 - 2009. Results indicated that the proportion of the Largemouth Bass population harvested was relatively low (9%) and more restrictive length limits would provide little benefit. In addition, impacts of tournaments on the Largemouth Bass population were low (only 5% of population retained by tournament anglers) but tournament expenditures were high (73% of total). Florida Largemouth Bass (FLMB) have been stocked annually since 1994 to increase abundance of large bass (>8 pounds). Giant salvinia was found in the reservoir in 2008 and is now present in a majority of creeks and embayments.
- **Fish Community**
  - **Prey species:** Gizzard Shad, Threadfin Shad, and Bluegill were the most abundant prey species and provided ample forage for sport fish.
  - **Catfishes:** The relative abundance of Blue and Channel Catfish was stable compared to previous years. Angler catch rates averaged 3.0/hour. Blue and Flathead Catfish provided trophy opportunities for anglers.
  - **Temperate basses:** Historically, White Bass abundance was low, but gill net catch increased in 2010. Since 2009, Yellow Bass abundance has increased. During the last three survey years, no anglers targeted temperate bass.
  - **Black basses:** Spotted Bass were present in low numbers. Largemouth Bass abundance increased over the last three survey years and was relatively high ( $\geq 200$  fish/hour). Size structure and fish condition were favorable. The black bass fishery was most popular (78% of anglers targeted bass) and angler catch rate was high (1.3/hour).
  - **Crappie:** White and Black Crappie were present in the reservoir. Angler catch (1.9/hour) reflected an abundant crappie population.
- **Management Strategies:** Stock FLMB annually to maintain and improve large fish abundance. Monitor Largemouth Bass population with biennial electrofishing and creel surveys. Continue tournament monitoring program to more effectively monitor abundance of larger fish. Maintain information signs, conduct annual aerial vegetation surveys, and apply herbicides when appropriate to minimize impacts of giant salvinia. Monitor the crappie fishery via biennial creel surveys. Monitor the catfish populations with biennial creel and gill net surveys. Publish monthly articles in the Lakecaster highlighting TPWD activities. Monitor angler access every four years.

## INTRODUCTION

This document is a summary of fisheries data collected from Sam Rayburn Reservoir from June 2012 through May 2013. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2012-2013 data for comparison.

### *Reservoir Description*

Sam Rayburn Reservoir is an impoundment of the Angelina River in Angelina, Jasper, Nacogdoches, Sabine, San Augustine, and Tyler counties in southeast Texas. The U.S. Army Corps of Engineers (USACE) constructed the reservoir in 1966 for flood control, generation of hydroelectric power, and for municipal, industrial, agricultural, and recreational uses. At conservation pool, Sam Rayburn Reservoir is 111,422 surface acres, has a shoreline length of 750 miles, and a mean depth of 20 feet. Water level fluctuations average 6 to 7 feet annually (Figure 1). The reservoir was eutrophic with a mean Trophic State Index chl-*a* of 48.1 (Texas Commission of Environmental Quality 2011). Habitat at time of sampling consisted of aquatic vegetation (primarily hydrilla and American lotus) and standing timber. Most of the land around the reservoir is used for timber production and agriculture. Other descriptive characteristics for Sam Rayburn Reservoir are in Table 1.

### *Angler Access*

Sam Rayburn Reservoir has 21 public boat ramps. Additional boat ramp characteristics are in Table 2. Shoreline access is limited to public boat ramp areas.

### *Management History*

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Driscoll and Ashe 2010) included:

1. Stock FLMB annually ( $\geq 500,000$  fingerlings) to maintain and improve the trophy Largemouth Bass population.  
**Action:** FLMB were stocked in 2011 and 2012.
2. Conduct annual electrofishing and biennial creel surveys to monitor status of Largemouth Bass population and examine growth every four years.  
**Action:** Electrofishing surveys were conducted in 2011 and 2012, and a creel survey was conducted in 2012/2013. Growth was examined in 2010.
3. Continue black bass tournament-monitoring program to increase information on relative abundance of large fish ( $> 20$  inches).  
**Action:** Since 2010, data from 93 tournaments were entered and are summarized in Appendix D.
5. Conduct annual vegetation surveys to monitor hydrilla abundance and locate giant salvinia coverage suitable for herbicide treatments.  
**Action:** Annual surveys were conducted in 2011 and 2012.
6. Conduct gill netting surveys every two years to monitor the status of catfish populations and examine growth every four years to ensure the 12-inch minimum length limit is appropriate.  
**Action:** Surveys were conducted in 2011 and 2013. Growth was examined in 2011.
7. Publish research related to November 2007 – October 2008 economic study in a peer-reviewed journal.  
**Action:** A manuscript has been submitted to the 2013 Conference of the Southeastern Association of Fish and Wildlife Agencies.

8. Promote fish handling procedures that minimize tournament-related mortality, impacts on Largemouth Bass population, and conflicts with non-tournament anglers.  
**Action:** Discussions with numerous tournament organizers and presentations for several bass clubs promoted optimum fish care in livewells and at weigh-ins. Advice was provided to Texas Black Bass Unlimited and the Cassels-Boykin Park Board regarding construction of permanent fish holding/hospital tanks and a fish release tube, and to Shelby County Bass Anglers regarding design of a fish release trailer.
9. Minimize giant salvinia introductions and overall plant coverage.  
**Action:** The Aquatic Habitat Enhancement office has led giant salvinia monitoring and control efforts. Educational signs at access sites were maintained. In 2011 and 2012, annual aerial surveys and monthly access point surveys were conducted. Plant control methods included herbicide treatments (contract applicators funded by the USACE) and salvinia weevil releases.
10. Publish monthly popular articles in the Lakecaster, a newsletter distributed to 30 counties in Texas and Louisiana.  
**Action:** Articles highlighting TPWD activities at Sam Rayburn Reservoir have been published monthly since 2000.

**Harvest regulation history:** Historically, all sport fishes in Sam Rayburn Reservoir have been managed with statewide regulations (Table 3).

**Stocking history:** Since 1994, Sam Rayburn Reservoir has received annual stockings of FLMB (Table 4). From 1991 to 2000, Palmetto Bass were stocked annually but were discontinued due to low directed angler effort and harvest. The complete stocking history is in Table 4.

**Vegetation/habitat management history:** Historically, aquatic vegetation coverage at Sam Rayburn Reservoir (primarily hydrilla) has approached 20,000 surface acres and included over 25 plant species. Since 2000, hydrilla coverage has ranged from 3,584 (2010) to 14,695 surface acres (2000). Low water level during 2010-2012 was likely the primary cause of hydrilla decline. Although hydrilla is an exotic, invasive species and is listed on the TPWD list of prohibitive plants, hydrilla has historically been considered beneficial habitat at Sam Rayburn Reservoir, as coverage has never been problematic or created access problems. Nuisance exotic species include common salvinia, giant salvinia, and water hyacinth. Common salvinia and water hyacinth have persisted in shallow backwaters of creeks and embayments and caused few problems. Giant salvinia was first documented in 2008, and persists in a majority of the embayments and creeks. In 2010 and 2012, the USACE hired a private herbicide applicator to treat 550 and 404 acres of giant salvinia, respectively. Low water levels in 2011 reduced salvinia abundance and no treatments were required.

**Water transfer:** Nearly 1,000,000 acre-feet of water rights are annually appropriated from Sam Rayburn Reservoir. The Lower Neches Valley Authority (LNVA) is the local sponsor of the reservoir and shared initial construction costs as well as annual reservoir operation expenses with the USACE. The LNVA has rights to 820,000 acre-feet annually to provide water via releases through the reservoir powerhouse. Municipal, agricultural, and industrial water is pumped from the lower Neches River and Pine Island Bayou and delivered to Jefferson, Chambers, and Liberty counties via a 400-mile canal system. The LNVA also contracts with Westvaco Corporation to provide their appropriated 50,000 acre-feet of water annually. The City of Lufkin has 56,000 acre-feet of water rights from Sam Rayburn Reservoir for future municipal and industrial use, but no infrastructure exists to pump water. The USACE has a contractual agreement with Southwest Power Corporation to produce hydropower throughout the year, independent of water rights.

## METHODS

Fishes were collected by electrofishing (2 hours at 24, 5-min stations during October) and gill netting (15 net nights at 15 stations during February). Catch per unit effort (CPUE) for electrofishing was recorded as

the number of fish caught per hour (fish/h) of actual electrofishing and for gill nets as the number of fish per net night (fish/nn). All survey sites were randomly selected and surveys conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011).

A roving creel survey (27 days; 9 days per quarter) was conducted from June 2012 through February 2013. Angler interviews were conducted on 5 weekend days and 4 weekdays per quarter to assess angler use and fish catch/harvest statistics in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011). Total angler catch of Largemouth Bass  $\geq$  4, 7, and 10 pounds was also estimated. Anglers were asked if released fish were within weight categories. Harvested fish lengths were converted to weights for classification (19 inches = 4 pounds; 23 inches = 7 pounds; 25 inches = 10 pounds).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified by Guy et al. (2007)], and condition indices [relative weights ( $W_r$ )] were calculated for target fishes according to Anderson and Neumann (1996). Index of Vulnerability (IOV) was calculated for Gizzard Shad (DiCenzo et al. 1996). Standard error (SE) was calculated for structural indices and IOV. Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE and creel statistics.

Source for water level data was the USACE website.

An aquatic vegetation survey was conducted in 2012 via airplane. Coverages were calculated for all prevalent species.

## RESULTS AND DISCUSSION

**Habitat:** A habitat survey conducted in 2002 indicated the littoral zone included primarily natural bank and standing timber (Table 5; Driscoll and Parks 2003). Approximately 24,000 acres of standing timber were present. Abundant areas of torpedograss, buttonbush, and *Salix* spp. are inundated when water level is above 164 feet MSL. Prevalent aquatic vegetation providing beneficial fish habitat includes hydrilla and American lotus (Table 6). Low lake levels during 2011-2012 caused all historically prevalent species to decline in coverage. Giant salvinia was first documented in 2008 and is present in a majority of embayments and creeks due to frequent introductions via boat trailers, plant growth, and wind dispersion. Since 2010, plant coverage has varied seasonally due to water level fluctuations, with maximum coverage during April/May (approximately 500 surface acres) and trace amounts during fall and winter.

**Creel:** Similar to previous survey years, fishing effort at Sam Rayburn Reservoir was primarily directed at black basses (78.4%) (Table 7). Total fishing effort for all species was 328,874 hours, and directed expenditures were \$3,751,136 (Table 8). However, expenditures estimated from creel surveys from the last three survey years were much lower than total annual expenditures derived from economic research in 2008 (\$32,259,314).

**Prey species:** Primary prey species included Gizzard Shad, Threadfin Shad, and Bluegill. Gizzard Shad catch rates and IOV have increased during the last three survey years (Figure 2). Historically, Threadfin Shad catch rates have been highly variable and likely not reflective of population status. The catch rate in 2012 was 959.5/h (Appendix A). During the last three survey years, Bluegill catch rates ranged from 295.5/h in 2010, 234.0/h in 2011, and 294.0/h in 2012 (Figure 3). Prey species abundance was adequate, as relative weights of sport fish were within desired ranges. No anglers targeted sunfish in 2012/2013 (Table 9).

**Catfish:** Historically, Blue Catfish recruitment has been relatively stable. During the last three survey years, catch rates ranged from 4.3/nn to 5.8/nn (Figure 5). Although few Blue Catfish >25 inches were collected,

anecdotal information indicates passive gear anglers frequently catch fish >30 pounds. Channel Catfish recruitment also appeared stable, and catch rates ranged from 4.7 (2013) to 6.5/nn (2011) (Figure 6).

Directed rod and reel angler effort and catch rates of catfishes were similar from 2008 to 2013 (Table 10). Catfish anglers accounted for 9 to 12% of the total fishing effort during the last three survey years. Total estimated harvest was 35,844 fish in 2012/2013; 92% of harvested fish were channel catfish (Figure 8).

**White Bass and Yellow Bass:** From 2004 to 2009, White Bass catch rates from gill net surveys were  $\leq 1.5/\text{nn}$ , indicating a low population density in the reservoir. In 2011, catch rates increased to 6.3/nn, reflecting an increase in recruitment (Figure 9). Catch rate in 2013 declined to 2.3/nn. Population abundance of Yellow Bass appears to be increasing, as catch rates were 2.8, 5.5, and 8.8 fish/nn during the last three survey years. Since 2008, no fishing effort was directed towards temperate basses (Table 11).

**Black bass:** Historically, electrofishing catch rates of Spotted Bass have been low. Catch rates were  $< 11.0/\text{h}$  from 2010 to 2012 (Figure 11). Few Spotted Bass >10 inches were collected. Estimated angler harvest was 3,507 fish in 2012/2013 (Figure 13).

Fall electrofishing catch rates of Largemouth Bass from 2010 to 2012 reflected relatively high recruitment rates (range = 200.0 - 282.5/h; Figure 12). Population size structure was similar across years (PSD range = 34 - 49; PSD-14 range = 18 - 24). Relative weights ranged from 82 to 108, indicating Largemouth Bass were in good condition.

The black bass fishery accounted for the majority of annual fishing effort (78.4%; Table 7). During the last three survey years, total angler directed effort (range = 257,825 - 333,203 h) and proportion tournament-related (range = 50 - 59%) was relatively stable (Table 12). Angler catch rates remained high and stable (range = 1.1 - 1.3 fish/h). Both non-tournament harvest and tournament weigh-in and released fish declined over the three survey years, while the proportion of legal fish released (non-tournament) increased to 74%. The majority of harvested Largemouth Bass were 14 to 16 inches in length (Figure 14) and 62% were retained during tournaments. The proportion of total catch for all four weight categories was similar during the last three survey years. Fish from 4 to 6.9 pounds comprised 2.9 to 3.4% of catch, and 7 to 9.9 pound fish comprised 0.3% of the catch each year.

Although the reservoir has been stocked with FLMB annually since 1994 (Table 4), reservoir-wide FLMB influence has remained low and relatively stable. Since 2006, FLMB alleles ranged from 43 to 51% and genotype ranged from 0 to 3% (Table 13).

A tournament-monitoring program was implemented in June 2003 to increase information on fish  $\geq 14$  inches and provide greater insight regarding large (> 20 inches) fish abundance (Appendix D). Overall, most tournament variables were favorable and similar during 2008 - 2012. The percent of anglers catching 5-fish limits was > 45% for the majority of years, indicating high and stable numbers of fish  $\geq 14$  inches. Average big bass weight in team tournaments was >8 pounds for all years, and average weight to win events ranged from 22.3 to 25.1 pounds, reflecting relatively high and stable numbers of large fish. Similarly, results of Sealy Outdoors McDonald's Big Bass Splash tournaments also suggested high and stable numbers of large bass.

**Crappie:** Creel data indicated that the total fishing effort directed at crappie has remained relatively stable during the last three survey years (range = 10.0 - 13.7%) (Table 7). Directed effort and harvest has declined since 2008/2009 (Table 14). However, angler catch rates were relatively high (range = 1.5 - 2.6 fish/h), reflecting an abundant crappie population.

## Fisheries management plan for Sam Rayburn Reservoir, Texas

Prepared – July 2013

**ISSUE 1:** Creel surveys indicate most sportfishing effort at Sam Rayburn Reservoir is for Largemouth Bass. The economic contribution of the Largemouth Bass fishery to the local area is high, as the total economic value of the recreational fishery was estimated at \$47.1 million. The reservoir also hosts over 400 bass tournaments per year with an economic value of \$32.0 million (Driscoll et al. 2010). The reservoir has also demonstrated the potential for producing trophy fish.

### MANAGEMENT STRATEGIES

1. Continue annual stocking of FLMB (500,000 fingerlings/year) to maintain and improve the trophy Largemouth Bass population.
2. Continue the tournament monitoring program to increase information on fish  $\geq$  14 inches.
3. Conduct biennial electrofishing and creel surveys to monitor status of Largemouth Bass population.
4. Examine Largemouth Bass growth every four years.
5. Continue to promote fish handling procedures that minimize tournament-related mortality to minimize impacts on Largemouth Bass population and reduce conflicts with non-tournament anglers.
6. Continue to consult with Texas Black Bass Unlimited and the USACE regarding design and completion of the tournament fish care facility at Cassels-Boykin Park. Evaluate efficacy of facility after completion.

**ISSUE 2:** In 2008, giant salvinia was found in Sam Rayburn Reservoir. The plant is now present in a majority of embayments and creeks due to frequent introductions via boat trailers, plant growth, and wind dispersion.

### MANAGEMENT STRATEGIES

1. Maintain all educational signs posted at Sam Rayburn Reservoir to minimize potential transport to other waters.
2. Utilize herbicide treatments and salvinia weevils to minimize coverage and related effects.
3. Conduct an annual reservoir-wide aerial survey and post-treatment surveys when applicable to monitor trends in giant salvinia coverage.

**ISSUE 3:** Historically, the crappie fishery at Sam Rayburn Reservoir was productive and popular. Directed effort and harvest has exceeded 3.0 h/acre and 400,000 fish, respectively. Since 2008, directed effort was  $<0.6$  h/acre and total harvest was  $< 100,000$  fish.

### MANAGEMENT STRATEGIES

1. Conduct biennial creel surveys to monitor the crappie fishery, as trap netting at Sam Rayburn Reservoir is not effective.
2. As part of research exploring fish attractor shape and material type, deploy 72 plastic fish attractors (each comprising 54 cubic feet of material) in 2013. Provide attractor locations to public via maps and publish GPS coordinates on the TPWD web site and in local media to increase angler catch of crappie.

**ISSUE 4:** A considerable catfish fishery also exists. Although the rod and reel catfish fishery is negligible, the majority of the actual directed catfish effort is due to passive gear anglers.

**MANAGEMENT STRATEGY**

1. Conduct gill netting surveys every two years to monitor catfish populations and examine growth every four years.

**ISSUE 5:** Area constituents are interested in TPWD activities and management actions related to Sam Rayburn Reservoir and need to be informed.

**MANAGEMENT STRATEGY**

1. Continue to publish monthly popular articles on TPWD activities in the Lakecaster, a newsletter distributed to approximately 30 counties in Texas and Louisiana.

**ISSUE 6:** Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches and plugging engine cooling systems. Giant salvinia and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing, and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

**MANAGEMENT STRATEGIES**

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
2. Contact and educate marina owners about invasive species, and provide them with posters and literature so they can educate their customers.
3. Educate the public about invasive species through the use of media and the internet.
4. Discuss invasive species when presenting to constituent and user groups.
5. Document existing and future inter-basin water transfers to facilitate potential invasive species responses.

**SAMPLING SCHEDULE JUSTIFICATION:**

The proposed sampling schedule includes biennial electrofishing and creel surveys to monitor the Largemouth Bass fishery (Table 13). Biennial creels are also needed to monitor the crappie fishery due to ineffectiveness of trap nets. Gill net surveys will be conducted every two years to adequately monitor catfish populations. Growth of Largemouth Bass and catfish will be examined every four years. Angler access surveys will be conducted every four years. Prevalent aquatic vegetation will be surveyed annually by air.

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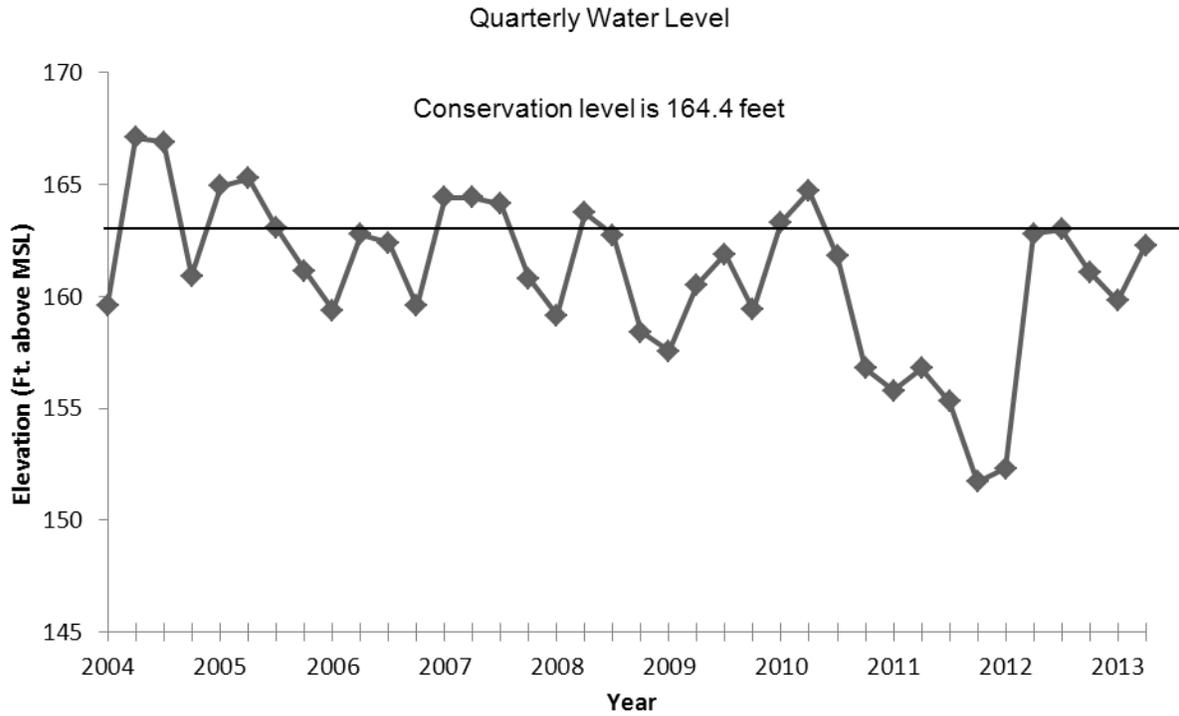


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Sam Rayburn Reservoir, Texas.

Table 1. Characteristics of Sam Rayburn Reservoir, Texas.

Characteristic	Description
Year constructed	1966
Controlling authority	U.S. Army Corps of Engineers
Counties	Angelina, Jasper, Nacogdoches, Sabine, San Augustine, and Tyler
Reservoir type	Mainstream
Shoreline Development Index (SDI)	16.25
Conductivity	120 uS/cm

Table 2. Boat ramp characteristics for Sam Rayburn Reservoir, Texas.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)
South Public	31.06760; -94.06395	Y	90
Twin Dikes	31.07524; -94.06818	Y	220
Sandy Creek	31.09588; -94.20363	Y	25
Caney Creek	31.13540; -94.25561	Y	72
Cassels-Boykin	31.21247; -94.35019	Y	144
Monterery Park	31.21262; -94.31095	Y	50
Hanks Creek	31.26812; -94.39908	Y	60
Ewing Park	31.37201; -94.48117	Y	20
Marion's Ferry	31.39718; -94.52679	Y	20
Kingtown	31.40910; -94.51677	Y	15
Etoile	31.37700; -94.46490	Y	45
Shirley Creek	31.30942; -94.37302	Y	30
Ralph McAllister	31.37532; -94.33169	Y	24
Townsend	31.34788; -94.31304	Y	20
Jackson Hill	31.27023; -94.32260	Y	40
Harvey Creek	31.21371; -94.32260	Y	25
Five Fingers	31.12935; -94.11796	Y	20
Rayburn Park	31.10501; -94.11017	Y	75
Powell Park	31.13034; -94.08379	Y	36
Highway 83	31.26591; -94.11160	Y	15
Mill Creek	31.14974; -94.00761	Y	45

Table 3. Harvest regulations for Sam Rayburn Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Largemouth	5 <sup>a</sup>	14-inch minimum
Bass, Spotted	5 <sup>a</sup>	None
Crappie: White and Black crappie, their hybrids and subspecies	25 (in any combination)	10-inch minimum

<sup>a</sup>Daily bag for Largemouth and Spotted Bass = 5 fish in any combination.

Table 4. Stocking history of Sam Rayburn Reservoir, Texas. FGL = fingerling; AFGL = advanced fingerling; ADL = adult; UNK = unknown.

<b>Species</b>	<b>Year</b>	<b>Number</b>	<b>Size</b>
Blue Catfish	1966	105,100	UNK
	1987	<u>199,870</u>	FGL
	Total	304,970	
Channel Catfish	1966	74,600	AFGL
	1966	6,100	FGL
	1973	<u>110,000</u>	AFGL
	Total	190,700	
Florida Largemouth Bass	1975	25,000	FRY
	1976	60,000	FRY
	1977	60,000	FRY
	1978	165,000	FGL
	1978	47,000	FRY
	1980	361,840	FGL
	1983	1,200	AFGL
	1983	37,700	FGL
	1987	249,660	FRY
	1990	1,000	AFGL
	1994	159,360	FGL
	1994	782,966	FRY
	1995	232,392	FGL
	1996	948,017	FGL
	1996	276,051	FRY
	1997	317,729	FRY
	1998	229,200	FGL
	1999	1,329,160	FGL
	2000	510,735	FGL
	2001	500,783	FGL
	2001	273,407	FRY
	2002	42	ADL
	2002	1,066,781	FGL
	2003	1,033,318	FGL
2003	291,008	FRY	
2004	523,648	FGL	
2005	1,026,943	FGL	
2006	499,858	FGL	
2007	500,033	FGL	
2008	501,382	FGL	
2009	1,284,341	FGL	
2009	377,936	FRY	
2010	500,100	FGL	
2011	952,285	FGL	

<b>Species</b>	<b>Year</b>	<b>Number</b>	<b>Size</b>
	2012	1,466,043	FGL
	Total	16,591,918	
Largemouth Bass	1965	364,000	FGL
	1966	97,000	FGL
	1988	21	ADL
	Total	461,021	
Longear Sunfish	1965	40,000	
	Total	40,000	
Paddlefish	1990	3,581	
	1991	16,741	
	1992	43,584	
	1995	46,529	
	Total	110,435	
Palmetto Bass	1979	571,400	FRY
	1981	447,528	FRY
	1982	1,000,000	FRY
	1985	1,000,000	FRY
	1987	1,500,000	FRY
	1988	1,100,000	FRY
	1989	279,748	FGL
	1989	1,130,036	FRY
	1991	1,111,683	FRY
	1992	1,347,961	FRY
	1993	1,140,000	FRY
	1994	1,175,000	FRY
	1995	943,903	FGL
	1995	1,469,882	FRY
	1996	116,000	FGL
	1997	186,577	FGL
	1998	406,229	FGL
	1998	168,428	FRY
	1999	289,974	FGL
	2000	290,990	FGL
	Total	15,675,339	
Redear Sunfish	1966	1,400	
	1967	530,000	
	Total	531,400	
ShareLunker Largemouth Bass	2008	2,604	FGL
	Total	2,604	

<b>Species</b>	<b>Year</b>	<b>Number</b>	<b>Size</b>
Striped Bass	1976	115,108	UNK
	1977	843,161	UNK
	1978	182,800	UNK
	1979	215,490	UNK
	1983	<u>1,000,000</u>	UNK
	Total	2,356,559	
Walleye	1973	426,000	FRY
	1974	349,400	FRY
	1975	378,376	FRY
	1976	<u>220,000</u>	FRY
	Total	1,373,776	
Warmouth	1965	80,000	
	1966	<u>800</u>	
	Total	80,800	
White Crappie	1965	<u>7,000</u>	FGL
	Total	7,000	

Table 5. Survey of structural habitat types, Sam Rayburn Reservoir, Texas, 2002. Shoreline habitat type units are in miles and standing timber is acres.

Habitat type	Estimate	% of total
Natural	401.4 miles	89
Rocky	6.8 miles	1
Standing timber	24,000 acres	10

Table 6. Aerial survey of prevalent aquatic vegetation, Sam Rayburn Reservoir, Texas, September 2008 - 2012. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Species	2008	2009	2010	2011	2012
American lotus	2,609 (2)	1,959 (2)	1,970 (2)	99 (< 1)	997 (1)
Common salvinia	26 (<1)	10 (<1)	trace	trace	trace
Giant salvinia	trace	trace	trace	trace	trace
Hydrilla	10,185 (9)	7,193 (6)	3,584 (3)	4,194 (4)	4,591 (4)
Pondweed	449 (<1)	2,394 (2)	trace	trace	trace
Water hyacinth	trace	trace	0 (0)	0 (0)	0 (0)

Table 7. Percent directed angler effort by species for Sam Rayburn Reservoir, Texas, 2008 – 2013. Survey periods were from 1 June through 31 May for 2008/2009 and 2010/2011 and 1 June through 28 February for 2012/2013.

Species	Year		
	2008/2009	2010/2011	2012/2013
Catfishes	11.6	9.8	9.4
Black basses	68.9	76.4	78.4
Temperate basses	0.6		
Crappies	13.7	11.6	10.0
Anything	5.1	2.3	2.1

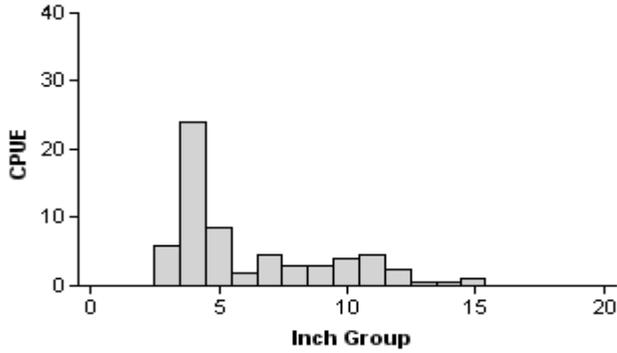
Table 8. Total fishing effort (h) for all species and total directed expenditures at Sam Rayburn Reservoir, Texas, 2008- 2013. Survey periods were from 1 June through 31 May for 2008/2009 and 2010/2011, and 1 June through 28 February for 2012/2013. Relative standard error is in parentheses.

Creel statistic	Year		
	2008/2009	2010/2011	2012/2013
Total fishing effort	483,465 (14)	350,874 (17)	328,874 (22)
Total directed expenditures	\$5,066,837 (18)	\$4,295,993 (24)	\$3,751,136 (26)

## Gizzard Shad

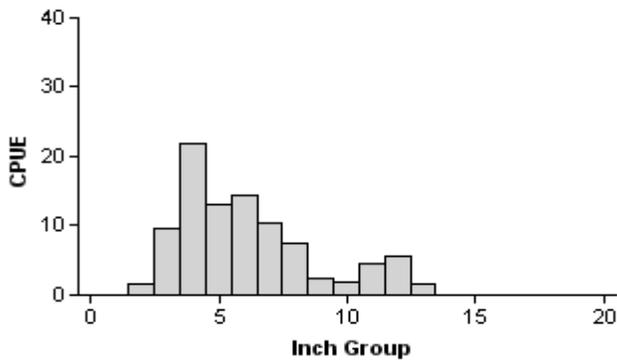
2010

Effort = 2.0  
 Total CPUE = 64.0 (32; 128)  
 IOV = 70 (6.3)



2011

Effort = 2.0  
 Total CPUE = 94.5 (34; 189)  
 IOV = 75 (10.5)



2012

Effort = 2.0  
 Total CPUE = 100.0 (33; 200)  
 IOV = 86 (4.6)

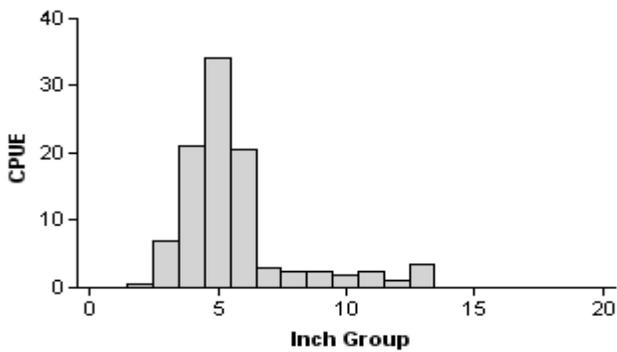


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Sam Rayburn Reservoir, Texas, 2010, 2011, and 2012.

# Bluegill

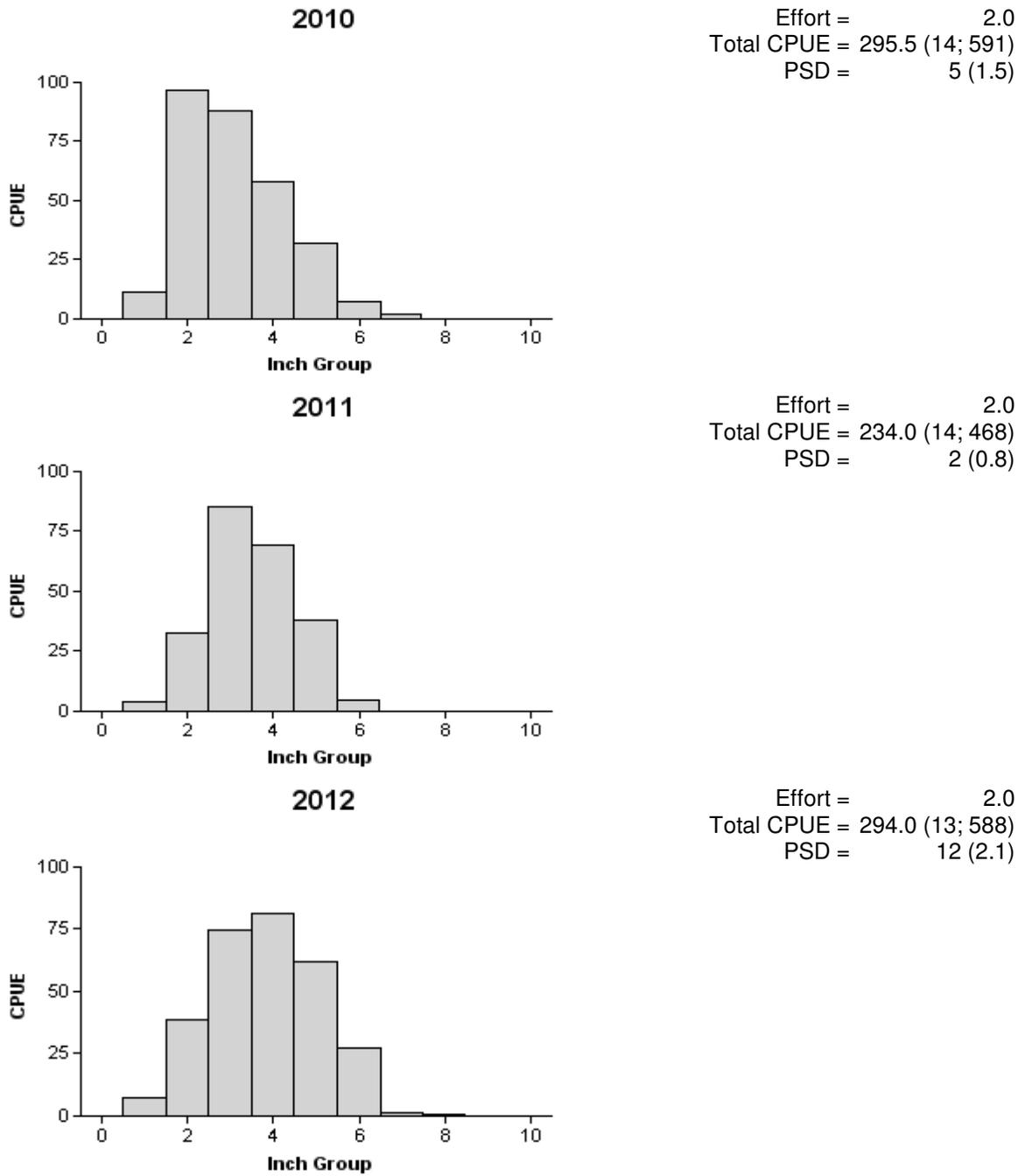


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Sam Rayburn Reservoir, Texas, 2010, 2011, and 2012.

## Sunfishes

Table 9. Creel survey statistics for sunfishes at Sam Rayburn Reservoir from June 2008 through May 2009, June 2010 through May 2011, and June 2012 through February 2013. Total catch per hour is for anglers targeting sunfishes and total harvest is the estimated number of sunfishes harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year		
	2008/2009	2010/2011	2012/2013
Directed effort (h)	2,921.88 (54)		
Directed effort/acre	0.03 (54)		
Total catch per hour	0.00 (.)		
Total harvest	1,389.19 (549)	2,102.88 (356)	3,208.30 (186)
Harvest/acre	0.01 (549)	0.02 (356)	0.02 (186)
Percent legal released	48	3	2

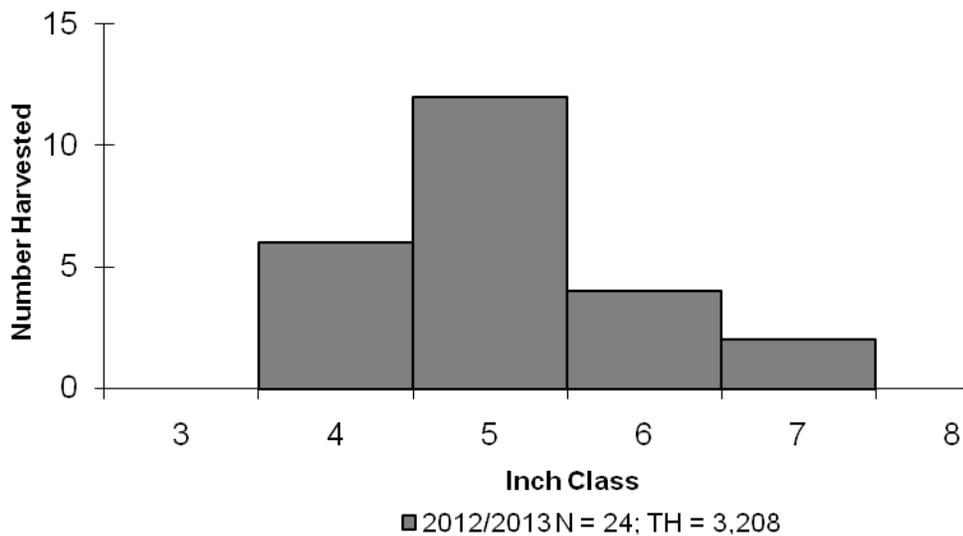
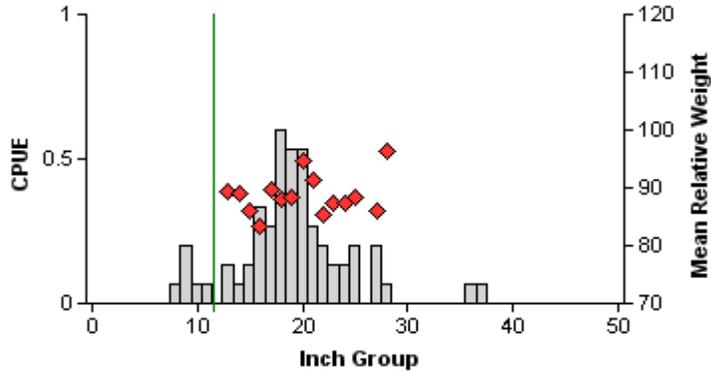


Figure 4. Length frequency of harvested Bluegill observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2012 through February 2013, all anglers combined. N is the number of harvested Bluegill observed during creel surveys, and TH is the total estimated harvest for the creel period.

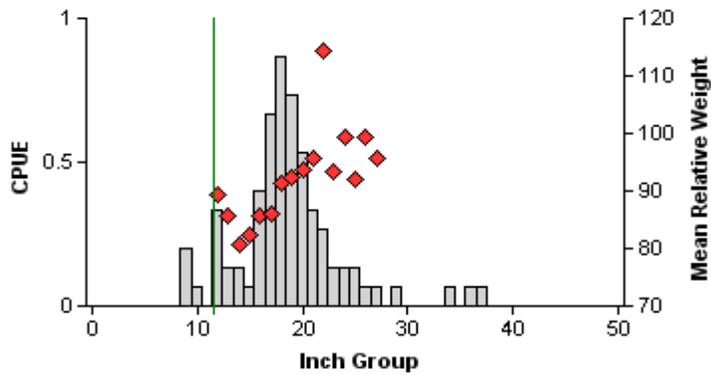
## Blue Catfish

2009



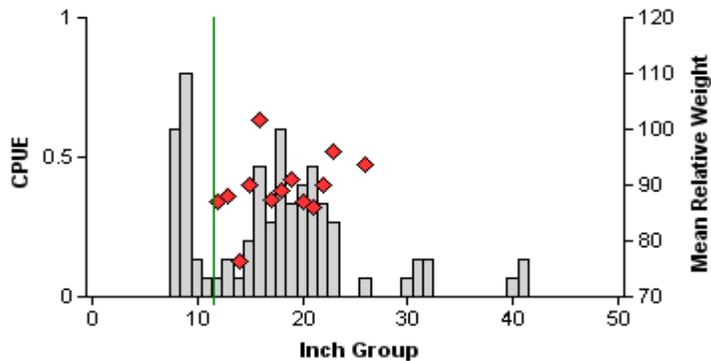
Effort = 15.0  
Total CPUE = 4.3 (22; 65)  
PSD = 47 (9.2)

2011



Effort = 15.0  
Total CPUE = 5.5 (25; 83)  
PSD = 37 (8.5)

2013



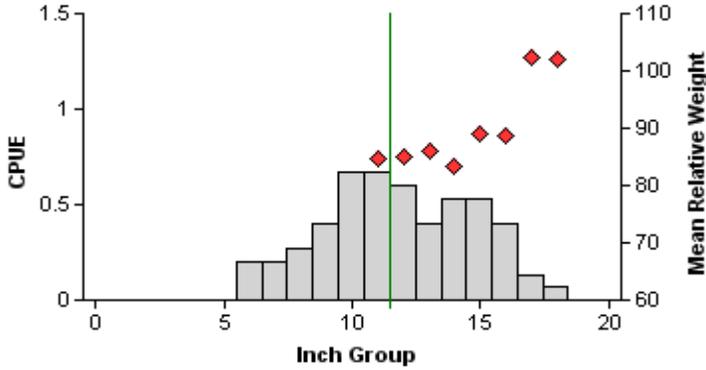
Effort = 15.0  
Total CPUE = 5.8 (30; 87)  
PSD = 49 (8.6)

Figure 5. Number of Blue Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Sam Rayburn Reservoir, Texas, 2009, 2011, and 2013. Vertical lines indicate minimum length limit at time of survey.

# Channel Catfish

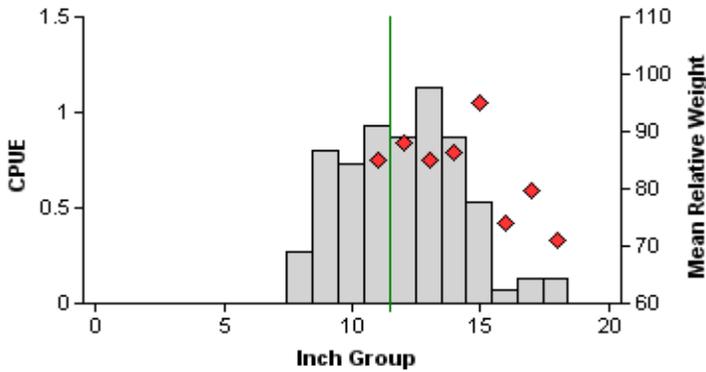
2009

Effort = 15.0  
 Total CPUE = 5.1 (10; 76)  
 PSD = 18 (8.2)



2011

Effort = 15.0  
 Total CPUE = 6.5 (27; 97)  
 PSD = 7 (4.5)



2013

Effort = 15.0  
 Total CPUE = 4.7 (30; 71)  
 PSD = 14 (7.4)

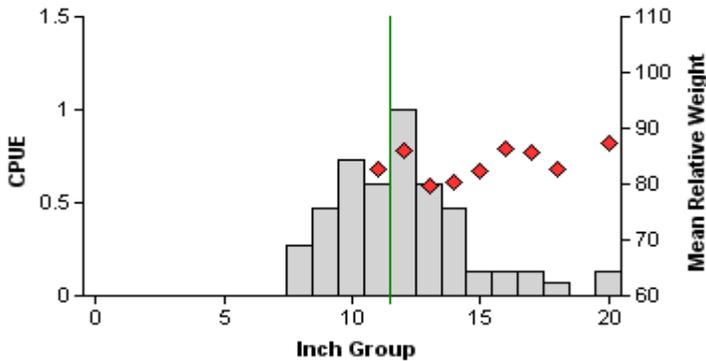


Figure 6. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Sam Rayburn Reservoir, Texas, 2009, 2011, and 2013. Vertical lines indicate minimum length limit at time of survey.

## Catfishes

Table 10. Creel survey statistics for catfishes at Sam Rayburn Reservoir from June 2008 through May 2009, June 2010 through May 2011, and June 2012 through February 2013. Total catch per hour is for anglers targeting catfishes and total harvest is the estimated number of catfishes harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year		
	2008/2009	2010/2011	2012/2013
Directed effort (h)	56,072.80 (23)	34,190.95 (25)	30,925.58 (37)
Directed effort/acre	0.49 (23)	0.31 (25)	0.28 (37)
Total catch per hour	2.92 (35)	2.81 (27)	2.96 (20)
Total harvest	112,484.60 (36)	54,250.39 (38)	35,843.73 (29)
Harvest/acre	0.98 (36)	0.47 (38)	0.32 (29)
Percent legal released	1	1	1

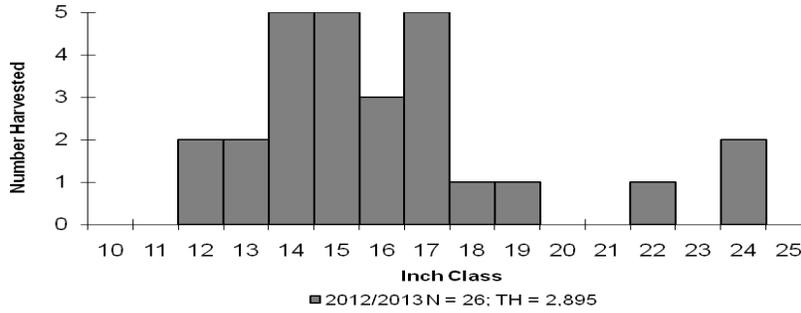


Figure 7. Length frequency of harvested Blue Catfish observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2012 through February 2013, all anglers combined. N is the number of harvested Blue Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

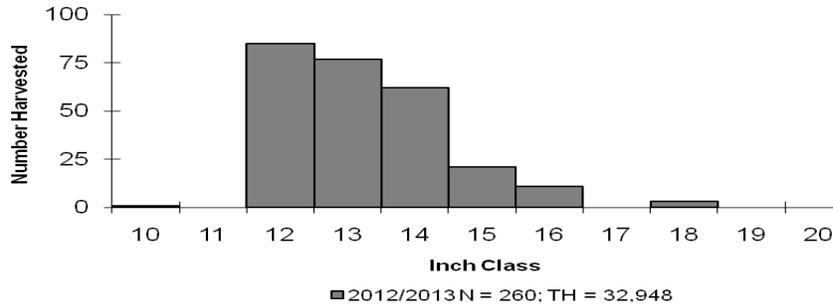


Figure 8. Length frequency of harvested Channel Catfish observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2012 through February 2013, all anglers combined. N is the number of harvested Channel Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

# White Bass

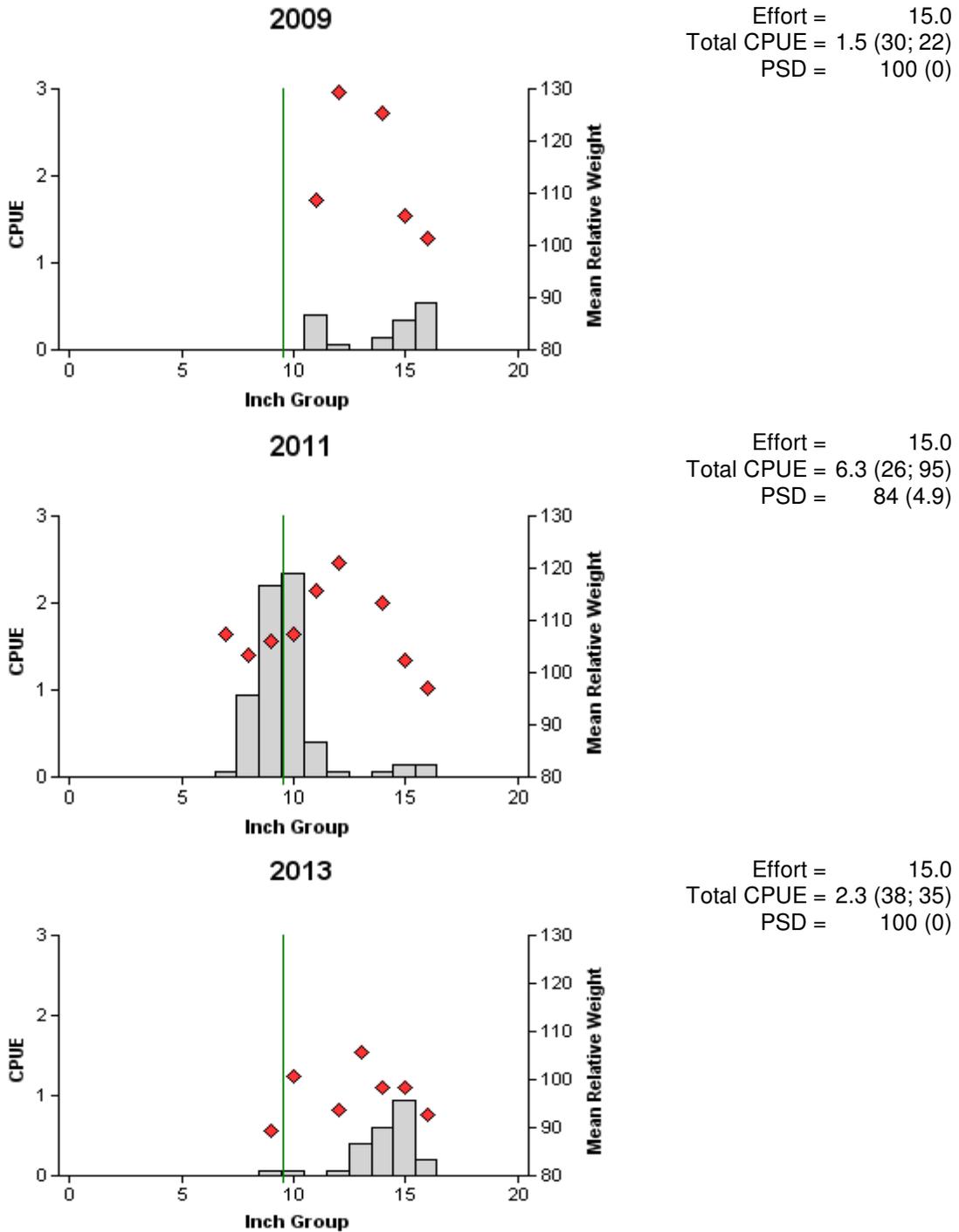


Figure 9. Number of White Bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Sam Rayburn Reservoir, Texas, 2009, 2011, and 2013. Vertical lines indicate minimum length limit at time of survey.

## Temperate Basses

Table 11. Creel survey statistics for temperate basses at Sam Rayburn Reservoir from June 2008 through May 2009, June 2010 through May 2011, and June 2012 through February 2013. Total catch per hour is for anglers targeting temperate basses and total harvest is the estimated number of temperate basses harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year		
	2008/2009	2010/2011	2012/2013
Directed effort (h)			
Directed effort/acre			
Total catch per hour			
Total harvest	1,461.22 (550)	482.93 (1029)	397.81 (447)
Harvest/acre	0.01 (550)	<0.01 (1029)	<0.01 (447)
Percent legal released	38	57	87

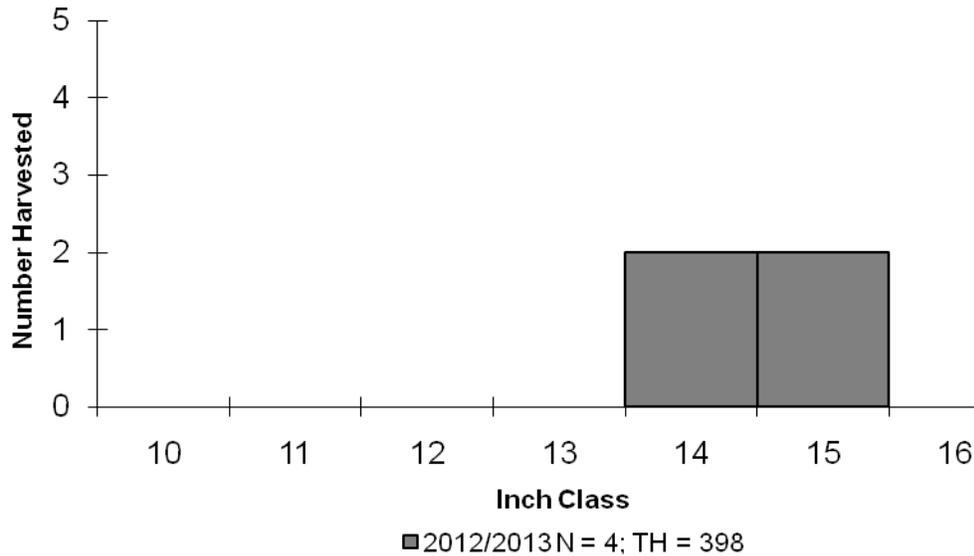
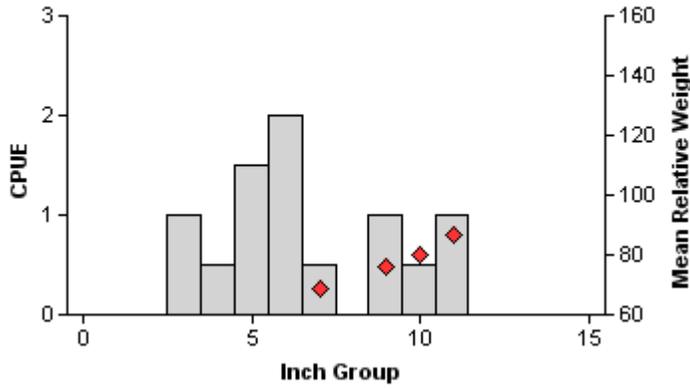


Figure 10. Length frequency of harvested White Bass observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2012 through February 2013, all anglers combined. N is the number of harvested White Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

## Spotted Bass

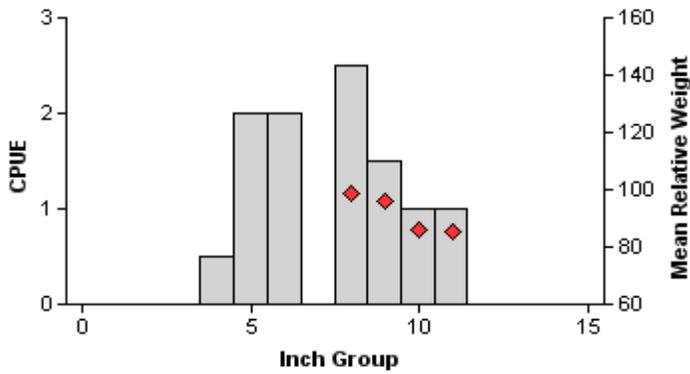
2010

Effort = 2.0  
 Total CPUE = 8.0 (45; 16)  
 PSD = 33 (21.2)



2011

Effort = 2.0  
 Total CPUE = 10.5 (38; 21)  
 PSD = 17 (10)



2012

Effort = 2.0  
 Total CPUE = 10.0 (35; 20)  
 PSD = 0 (62.9)

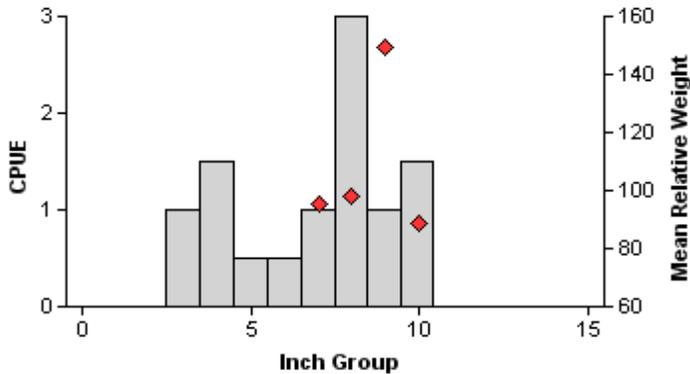


Figure 11. Number of Spotted Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE) for fall electrofishing surveys, Sam Rayburn Reservoir, Texas, 2010, 2011, and 2012.

# Largemouth Bass

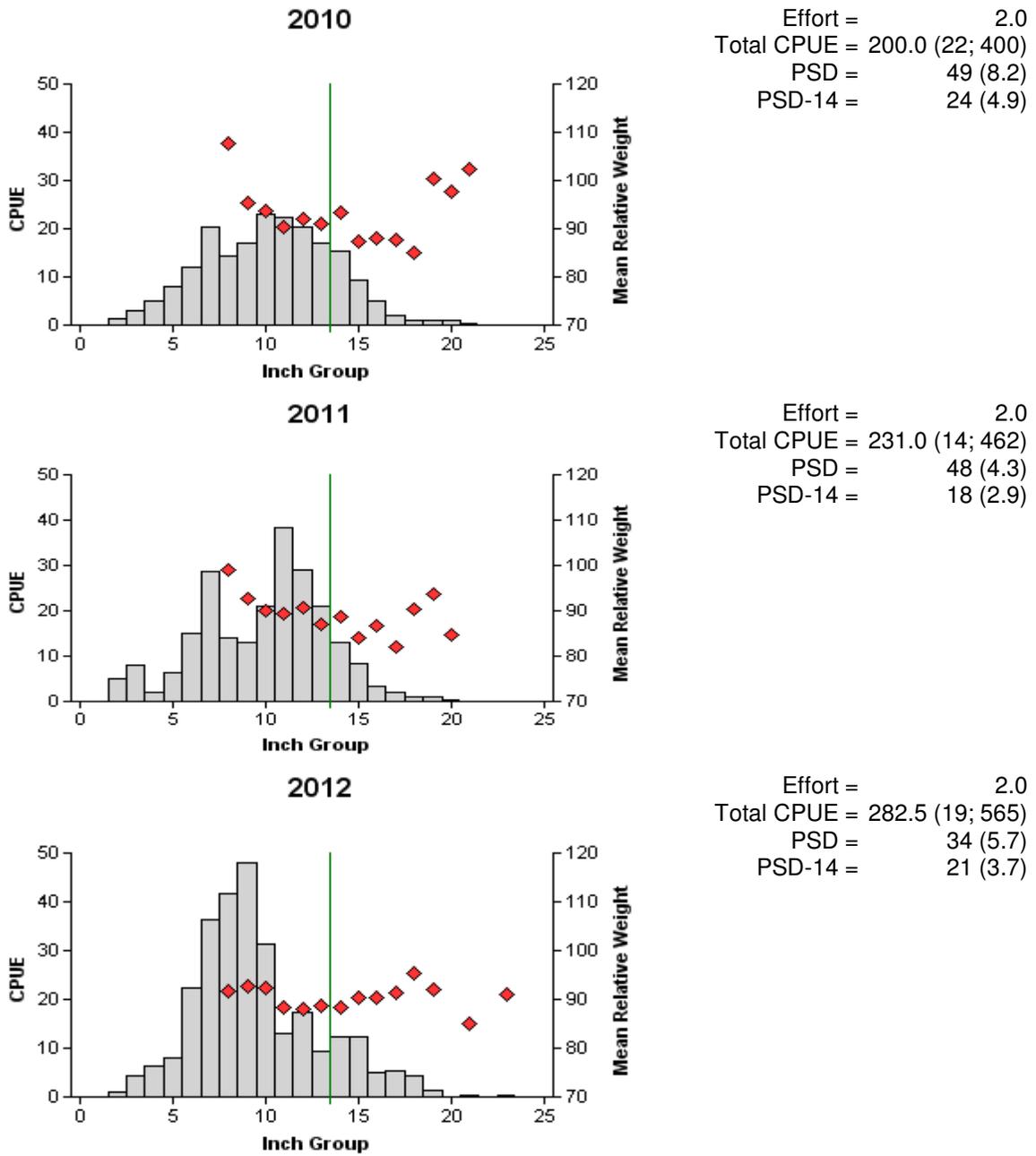


Figure 12. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Sam Rayburn Reservoir, Texas, 2010, 2011, and 2012. Vertical lines indicate minimum length limit at time of survey.

## Black Basses

Table 12. Creel survey statistics for black basses at Sam Rayburn Reservoir from June 2008 through May 2009, June 2010 through May 2011, and June 2012 through February 2013. Catch rate is for all anglers targeting black basses. Harvest is partitioned by the estimated number of fish harvested by non-tournament anglers and the number of fish retained by tournament anglers for weigh-in and release. The estimated number of fish caught by weight category is for all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year		
	2008/2009	2010/2011	2012/2013
Directed angling effort (h)			
Tournament	166,717.46 (16)	157,749.58 (18)	135,145.12 (22)
Non-tournament	166,485.97 (16)	109,356.25 (19)	122,679.65 (22)
All black bass anglers combined	333,203.43 (16)	267,105.83 (18)	257,824.77 (22)
Angling effort/acre	2.9 (15)	2.4 (18)	2.3 (22)
Catch rate (number/h)	1.1 (11)	1.2 (16)	1.3 (12)
Harvest			
Non-tournament harvest	36,482.18 (58)	19,233.30 (54)	11,452.77 (51)
Harvest/acre	0.3 (58)	0.1 (54)	0.1 (51)
Tournament weigh-in and release	77,462.62 (30)	34,073.46 (29)	12,644.82 (43)
Total catch	455,788.35 (17)	275,270.42 (16)	262,560.43 (25)
< 4.0 lbs	441,444 – 96.9%	265,000 – 96.2%	255,227 – 97.2%
≥ 4-6.9 lbs	13,144 – 2.9%	9,267 – 3.4%	6,525 – 2.5%
≥ 7-9.9 lbs	1,200 – 0.3%	872 – 0.3%	807 – 0.3%
≥ 10 lbs	0	131 - <0.1%	0
Percent legal released (non-tournament)	50	55	74

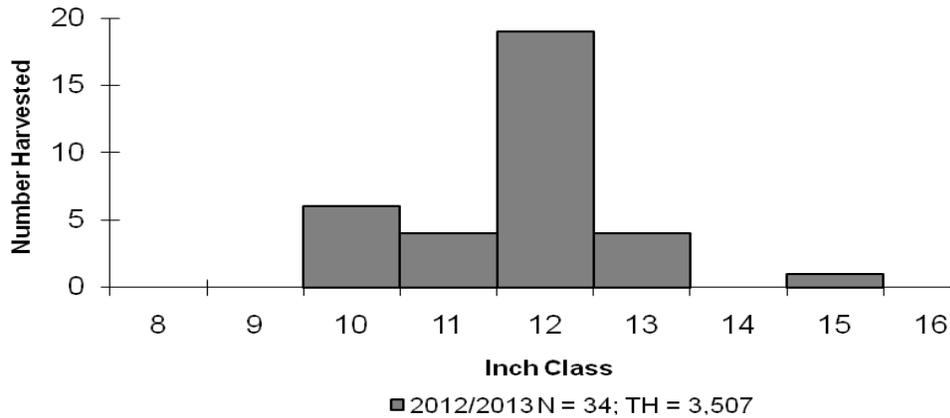


Figure 13. Length frequency of harvested Spotted Bass observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2012 through February 2013, all anglers combined. N is the number of harvested Spotted Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

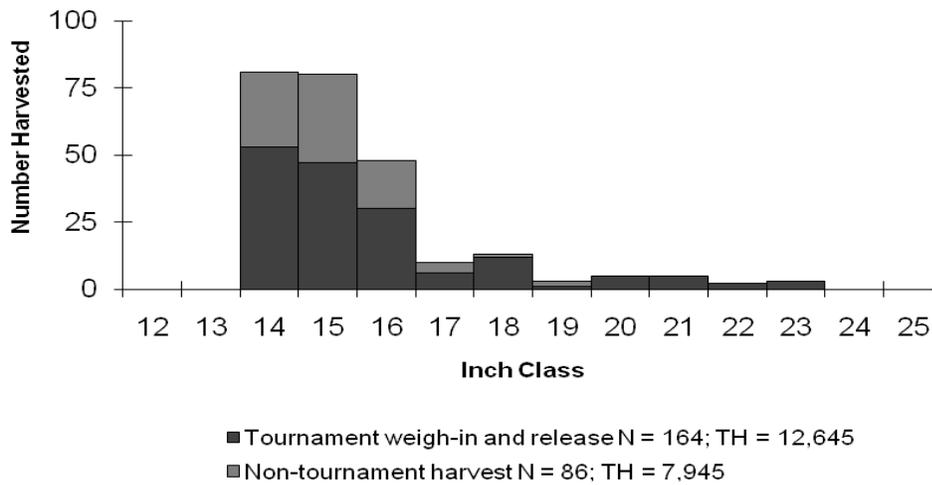


Figure 14. Length frequency of harvested Largemouth Bass observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2012 through February 2013, all anglers combined. N is the number of harvested Largemouth Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 13. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Sam Rayburn Reservoir, Texas, 2006, 2007, and 2010. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB.

Year	Sample size	Number of fish			% FLMB alleles	% FLMB
		FLMB	Intergrade	NLMB		
2006	50	2	48	0	51	3.0
2007	30	0	27	3	53	0.0
2010	30	0	27	3	43	0.0

## Crappies

Table 14. Creel survey statistics for crappies at Sam Rayburn Reservoir from June 2008 through May 2009, June 2010 through May 2011, and June 2012 through February 2013, where total catch per hour is for anglers targeting crappies and total harvest is the estimated number of crappies harvested by all anglers. Relative standard errors (RSE) are in parentheses

Creel Survey Statistic	Year		
	2008/2009	2010/2011	2012/2013
Directed effort (h)	66,380.71 (18)	40,431.86 (21)	32,866.80 (32)
Directed effort/acre	0.58 (18)	0.36 (21)	0.29 (32)
Total catch per hour	1.52 (25)	2.57 (27)	1.93 (24)
Total harvest	99,086.78 (18)	89,575.74 (50)	46,242.71 (40)
Harvest/acre	0.87 (18)	0.80 (50)	0.42 (40)
Percent legal released	<1	1	0

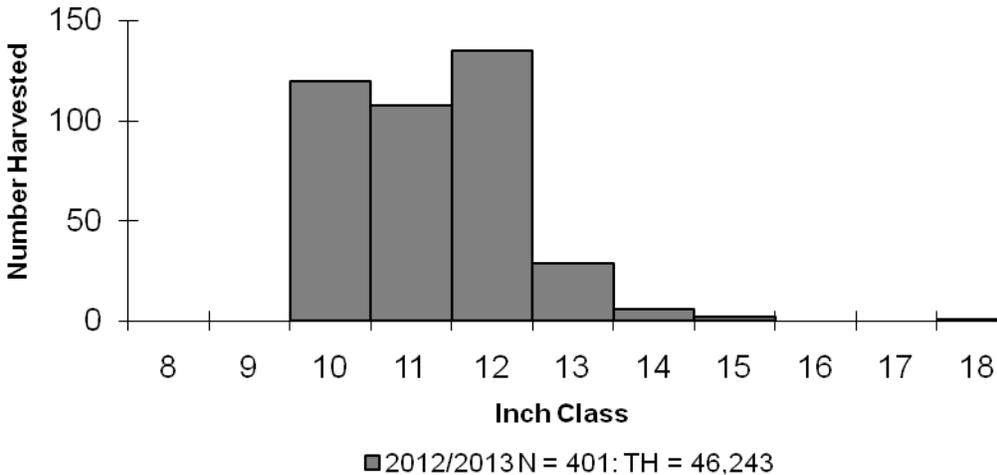


Figure 15. Length frequency of harvested crappie observed during creel surveys at Sam Rayburn Reservoir, Texas, June 2012 through February 2013, all anglers combined. N is the number of harvested crappies observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 15. Proposed sampling schedule for Sam Rayburn Reservoir, Texas. Survey period is June through May. Gill netting surveys are conducted in the winter, while electrofishing surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

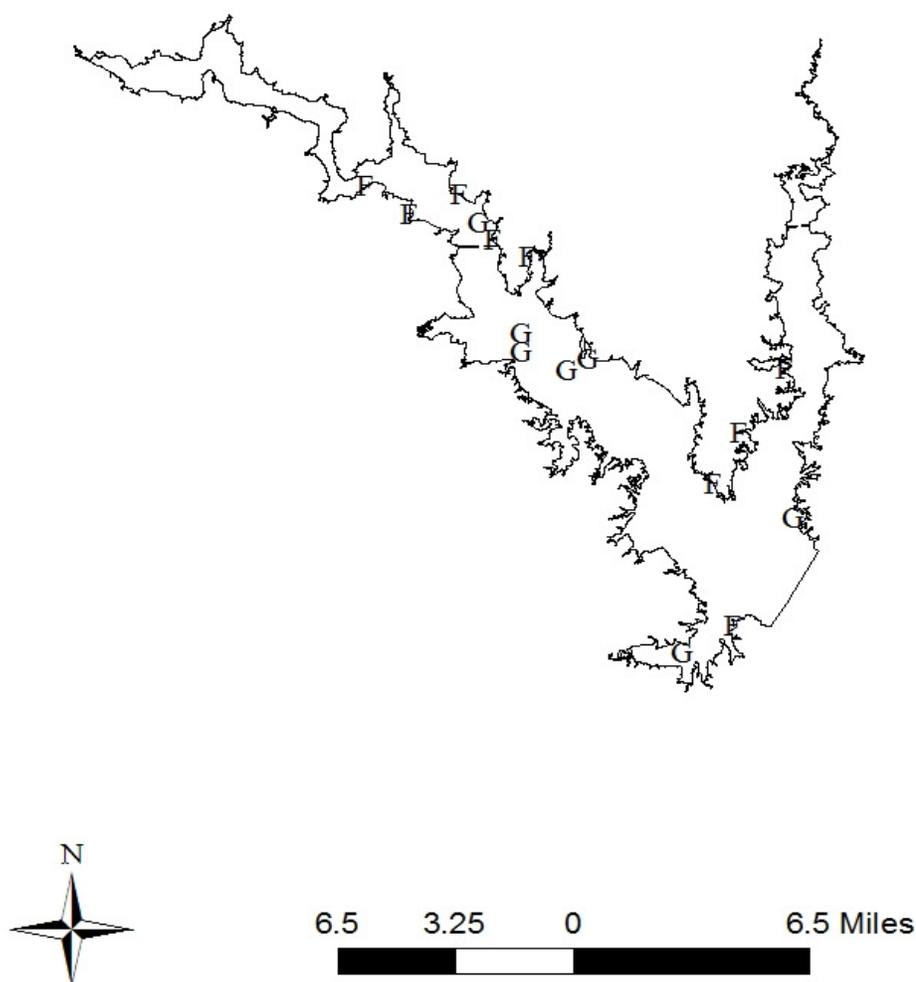
Survey year	Electrofishing Fall	Gill net	Habitat		Access	Creel survey	Report
			Structural	Vegetation			
2013-2014				A			
2014-2015	S	S		S	S	A	S
2015-2016				A			
2016-2017	A	A		A		A	A

**APPENDIX A**

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Sam Rayburn Reservoir, Texas, 2012-2013. Sampling effort was 15 net nights for gill netting and 2 hours for electrofishing.

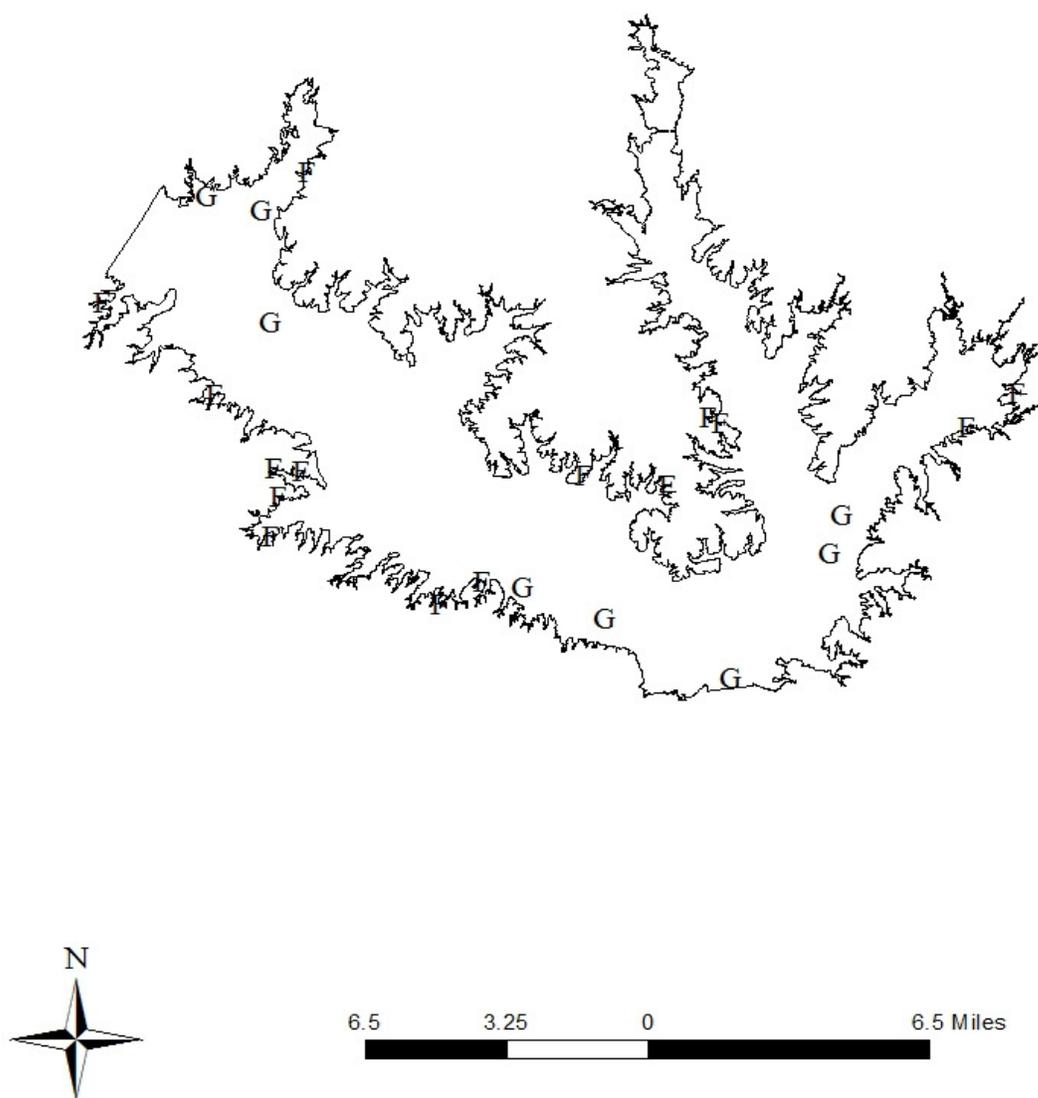
Species	Gill Netting		Electrofishing	
	N	CPUE	N	CPUE
Gizzard Shad	131	8.7	200	100.0
Threadfin Shad			1,919	959.5
Common Carp	11	0.7		
Yellow Bullhead	3	0.2		
Blue Catfish	87	5.8		
Channel Catfish	71	4.7		
White Bass	35	2.3		
Yellow Bass	132	8.8		
Redbreast Sunfish			10	5.0
Warmouth			27	13.5
Bluegill			588	294.0
Longear Sunfish	1	0.1	63	31.5
Redear Sunfish			93	46.5
Redspotted Sunfish			5	2.5
Spotted Bass	8	0.5	20	10.0
Largemouth Bass	12	0.8	565	282.5
White Crappie	4	0.3		
Black Crappie	7	0.5		
Freshwater Drum	16	1.1		

## APPENDIX B



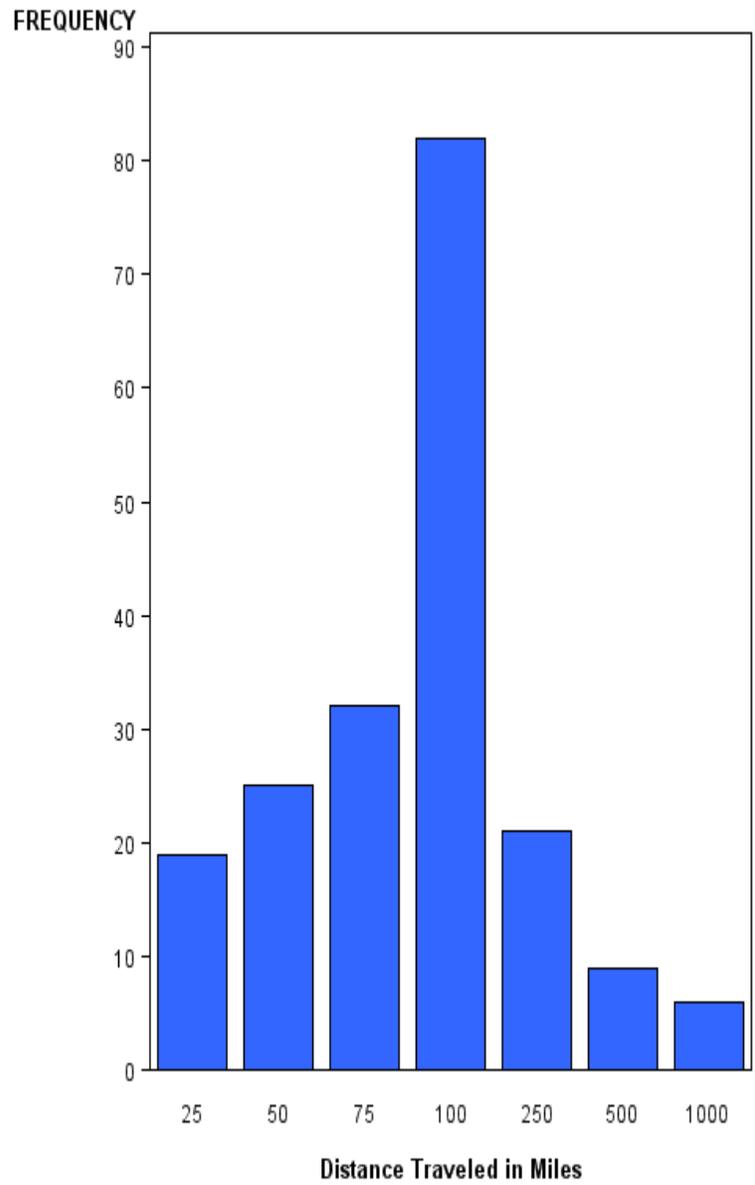
Location of sampling sites, north Sam Rayburn Reservoir, Texas, 2012-2013. Gill net and electrofishing stations are indicated by G and F, respectively. Water level was 2 to 6 feet below full pool at time of sampling.

## APPENDIX B



Location of sampling sites, south Sam Rayburn Reservoir, Texas, 2012-2013. Gill net and electrofishing stations are indicated by G and F, respectively. Water level was 2 to 6 feet below full pool at time of sampling.

**APPENDIX C**



Frequency of anglers that traveled various distances (miles) to Sam Rayburn Reservoir, Texas, as determined from the June 2012 through February 2013 creel survey.

**APPENDIX D**

Results from individual and team format black bass tournaments at Sam Rayburn Reservoir, 2008 - 2012. Only tournaments with 5-fish bag limits and > 50 participants or teams were included. Weights are expressed in pounds.

Year	N	1 <sup>st</sup> place weight	2 <sup>nd</sup> place weight	3 <sup>rd</sup> place weight	% total weights > 15 lbs.	% catching limit	Big bass weight
<b>Individual</b>							
2008	7	21.2	19.8	19.1	10.5	53.5	8.1
2009	11	18.9	17.4	16.1	5.6	31.0	8.5
2010	9	20.7	18.2	17.0	9.4	41.9	7.6
2011	8	20.4	16.7	16.1	3.4	45.9	7.3
2012	11	22.0	18.4	17.3	6.8	52.6	8.4
<b>Team</b>							
2008	24	23.9	21.9	20.7	17.8	57.8	8.9
2009	22	22.3	20.2	19.1	10.5	48.3	8.9
2010	28	25.1	22.5	21.3	21.7	60.6	8.7
2011	24	23.6	21.5	19.2	12.9	47.5	8.1
2012	13	24.3	22.6	21.0	17.0	56.4	8.9

Results of Sealy Outdoors McDonald's Big Bass Splash tournaments, Sam Rayburn Reservoir, 2009 – 2013. Weights are expressed in pounds.

Year	Average weight of Top 10 fish/hour	Average weight of Top 10 fish/day	Average weight of overall top 10 fish	Weight of overall big fish
2009	6.7 (240)	9.0 (30)	10.0 (10)	10.9
2010	6.7 (240)	8.7 (30)	9.3 (10)	10.6
2011	5.8 (240)	8.0 (30)	9.1 (10)	10.7
2012	5.2 (240)	7.4 (30)	8.3 (10)	10.8
2013	5.6 (240)	7.7 (30)	8.7 (10)	9.9